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II. Solution by **G. W. GREENWOOD, A. M.,** Dunbar, Pa.

Taking as x-axis the fixed side AB $(=2a)$ and its mid-point as origin, the in-center, since it lies on the bisectors of the angles A and B, must satisfy the equations $y=m_1(x-a)$, $y=m_2(x+a)$, where

$$m_1=\tan\left(\pi-\frac{A}{2}\right)=-\tan\frac{A}{2},\quad m_2=\tan\frac{B}{2}.$$

The opposite angle being constant, $A+B$ is constant. Hence

$$\tan\left(\frac{A}{2}+\frac{B}{2}\right)=\frac{-m_1+m_2}{1+m_1m_2}=\text{a constant}=c,\text{ say.}$$

Hence the in-center satisfies the equation $c(x^2+y^2-a^2)+2ay=0$.

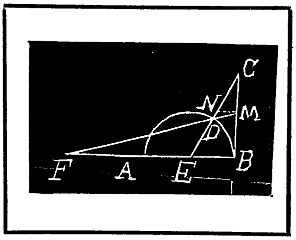
Also solved by J. Scheffer, William Hoover, and L. E. Newcomb.

298 (Incorrectly numbered 296). Proposed by **J. J. QUINN, Ph. D.,** Scottdale, Pa.

Given $AB=BC$ perpendicular to each other, and E and M their mid-points, respectively. On AB describe a semi-circle, and draw CE to meet the circumference in D. Draw DM cutting AB in F. In what ratio is AB divided by the point F?

Solution by **C. N. SCHMALL, A. B.,** 89 Columbia Street, New York; **L. E. NEWCOMB,** Los Gatos, California; and **A. H. HOLMES,** Brunswick, Maine.

From the figure, constructed as described in the problem, we have



$FE : ED=NM : ND$. But $NM=\frac{1}{2}EB$, and

$$ND=CD-CN=CD-\tfrac{1}{2}CE\ldots(1).$$
$$\therefore FE : ED=\tfrac{1}{2}EB : CD-\tfrac{1}{2}CE\ldots(2).$$

Also $AB^2=CD.CD'$, where D' is the second intersection of the secant, CE, with the circle. Now let $FA=x$, $EB=r$, $CD=a$. Then $FE=x+r$, $CE=a+r$. Substituting these values in (1) and (2), we have

$$x+r : r=\tfrac{1}{2}r : a-\tfrac{1}{2}(a+r)\ldots(3),$$
$$(2r)^2=a(a+2r)\ldots(4).$$

From (4), $a=r(\pm\sqrt{5}-1)$, and from (3),

$$a=r+\frac{r^2}{x+r}.\quad \therefore r(\pm\sqrt{4}-1)=r+\frac{r^2}{x+r}.$$

Whence $x=(\pm\sqrt{5}+1)r$. $\therefore FA/AB=\frac{1}{2}(\pm\sqrt{5}+1)$.

Also solved by G. W. Greenwood and J. Scheffer.